


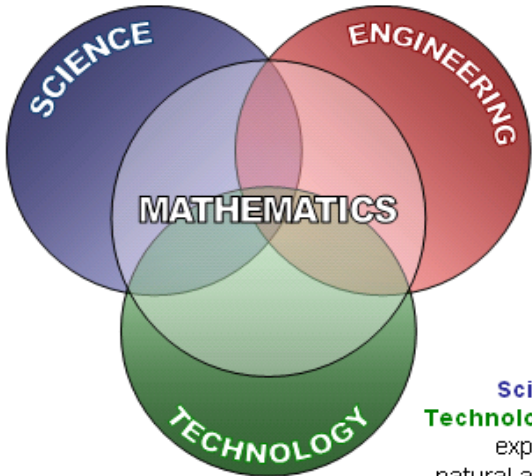
SCIENCE METHODS - ELED 4140 ASSIGNMENT DESCRIPTIONS

- Learning Log
- Bottle Rocket Inquiry PBL
- Science Shoebox or Fabric Kit
- Inquiry Project
- Top 10 iPad List/Article
- 6E Lesson Plan & Demonstration Lesson
- NSTA Learning Center Exploration
- Project CENTS workshop completion – PLT & WET
- Disposition



Tennessee Vision for **STEM** Education

Science seeks to explain the complexity of the natural world and uses this understanding to make valid and useful predictions.



Engineering creatively applies scientific principles to analyze events, design processes, develop materials, and construct objects that benefit society.

Technology utilizes innovative tools, materials, and processes to solve problems or satisfy the needs of individuals, society, and the environment.

Science, Engineering and Technology use **Mathematics** to explore questions about the natural and human-made worlds.

Adapted with permission from the Massachusetts Science and Technology / Engineering Curriculum Frameworks.

Find out more at: <http://www.stemresources.com/>

LEARNING LOG – 75 POINTS

You will need to maintain a learning log for this course. You can use a 3-ring binder for this purpose. In the log, you will make journal entries based on course readings outside of class and make entries during class as part of activities led by the instructor and/or other students within the class. Logs will be collected at the end of the semester.

Purpose:

Prepare you for class discussions and provide you with a written record of class content to be used as a reference. The Learning Log also allows you to be reflective and document your questions and they allow for individual creativity. Please remember that you are not writing the log to me, but to yourself.

Begin with a Table of Contents. Include the date and add a title to each entry and # the pages starting with 1.

Before class

Complete the assigned graphic organizer(s) for the reading(s) of the day.

During Class

Document class activities and your reactions to discussion of experiences/readings with peers and class in writing. We will often have activities conducted by your instructor and/or your peers that include handouts that you should include in your learning log as well.

Grading Criteria

	Points Possible	Points Earned
Documentation of Out-of class Readings		
Table of Contents is complete; each page is dated and labeled.	10	
Graphic Organizer is completed for each reading	25	
Documentation of In-Class Activities & Reflections		
Makes an extensive effort to document scientific activities & reflect through writing	20	
Includes handouts and materials provided by instructor and peers	20	
Total points	75	

TOP 10 IPAD APP LIST & ARTICLE – 50 POINTS

The class will be divided into 3 groups for this project:

- Early Elementary K-2
- Upper Elementary 3-5
- Middle School 6-8

Part I: Top 10 List

Each person will individually search and find 10 apps he/she recommends for science instruction at their selected grade range. The list should include the name of the app, publisher, specific content standard addressed (GLE & spi), cost, description of the app, & suggestions for how it would be used for instruction. The individual members will share their research in class with the rest of their group. Each group will determine the “best apps” and we will order several from each group.

Part II: Science & Children Article

After the apps have been used during the semester, for instruction during methods class or within the practicum, grade level groups will collaborate to write a brief article for *Science and Children* magazine. Your group can be creative in the way in which you prepare your article. The magazine has a section devoted to notable tradebooks in each issue. You have been asked to design a section to share apps – best practices in using them as well as your favorite apps for teaching specific topics. The title of this section of the magazine will be called, “Teaching Science? There’s an App for That!”. Develop an attractive layout and design for your article using Pages or Word (or another program of your choice). Include graphics that you create using Web 2.0 tools if possible.

There will be limited time in class to work on this assignment. Be prepared to meet out of class and use online tools such as Google Docs to help you collaborate.

Grading Criteria

	Points Possible	Points Earned
Top 10 List		
List is prepared individually in order to discuss in class by the assigned date	10	
Science & Children Article		
Group collaborates out of class and makes an obvious effort to contribute to the team.	15	
Finished article is organized and has a professional layout	20	
Article includes a description of apps based on a specific theme and shows evidence that the authors have working knowledge of each app	20	
Spelling, Grammar, Mechanics	10	
Total points	75	

SCIENCE SHOEBOX OR FABRIC KIT – 50 POINTS

You will develop a shoebox kit that contains a set of materials and instructions for a single activity. The activity should be intended as an individualized experience that is related to a current topic of study or reinforces a recent topic. The shoebox is a ready-to-use kit that is planned in such a way that children can retrieve it from a nearby shelf or learning center, return to their seats, and complete the activity without additional help. The activity can be highly structured or more of an open inquiry. A good shoebox contains the following for the student:

- A statement of the task objective
- A list of the materials in the box
- A list of instructions to guide the student to successful completion of the task. *The activity needs to incorporate writing in our Learning Logs.*
- Include what you would like the students to do for cleanup (how should they leave the box when finished with the activity?)
- All materials needed to follow instructions given
- An assessment – a list of questions students should be able to answer following completion of the activity.

Please decorate your cardboard shoebox creatively or use a clear, colored, patterned plastic or cardboard box. Feel free to use a larger box if you need to. Shoeboxes will be tested by your peers on the due date. They will provide you with feedback.

Also prepare a paper to hand in to the instructor that includes the bulleted items above (with the exception of the fifth bullet). Include the grade level, content area, content standard, grade level expectation, and performance indicator for which the box is intended. Include ideas of how the shoebox could be integrated across the curriculum with standards referenced (at least 3). Include background knowledge for the teacher. You can select your activity from classroom resource books, NSTA resources, the internet, or other source. Be sure to include references for your source(s).

Please see complete example of shoebox assignment posted on the Science Methods Wiki.

	Points Possible	Points Earned
Shoebox contains the task objective & list of materials	5	
Shoebox contains instructions that students can follow without additional guidance from the teacher	10	
All necessary materials are included in the box	5	
A list of assessment questions that are aligned to the box activity	5	
A paper is handed in to the instructor with the required components: (4 points each) – <u>also upload to the Science Methods Wiki page by the evening before sharing in class</u> <ul style="list-style-type: none"> • Grade Level, Content area & standard, grade level expectation, & PI • Integration across curriculum (at least 3) • Background Knowledge for teacher • References – exact URL if internet is used • Also Include: Task objective, materials in box, student instructions, Assessment Questions 	20	
Spelling, Grammar, and Mechanics	5	
Total Points	50	

Tradebook Fabric Activity Kit – Alternative to Shoebox

Purpose: to integrate tradebooks with science and/or across the curriculum.

Components: Tradebook, fabric kit (see instructions), 4 activity cards, materials needed to complete activities

In addition you will need to hand in a paper to your instructor including:

- Reference information for Book as well as a short paragraph summary of the book
- Grade level
- Subject(s)
- performance indicators
- text for the activity cards
- Include references for any sources you used for activity ideas

Assessment– a list of questions students should be able to answer following completion of the activities.

Suggested Steps:

- Begin this assignment by identifying objectives that are appropriate for your grade level of interest. Select an associated tradebook. Design 4 activities that you can describe on cards to place inside your fabric kit. These activities can be all for science or you can do a combination of activities across the curriculum (i.e. 1 science, 1 math, 1 social studies, 1 language arts or 2 science and 2 math, etc.). Create cards – laminate if possible. See example cards posted on Science Methods Wiki for *Oceans - Kindergarten*. (Note: Kindergarten uses Grade Level Expectations – be sure to include state performance indicators for your project)
- Collect materials that you will need for students to complete the activities and put them in a container to store with your fabric kit.
- Create your fabric kit or borrow one from instructor.

Please bring your kit, tradebook, materials, and paper to class on your assigned date. The class will rotate in groups to complete each project.

Please see complete example of fabric kit assignment posted on the Science Methods Wiki.

Fabric Kit Grading Sheet

	Points Possible	Points Earned
Task cards are easy to understand and written on a level appropriate for the selected grade level	7.5	
All necessary materials needed for completing each task are organized in a container for student use	5	
Tasks are written to develop critical thinking skills and go beyond a typical “worksheet (avoid word searches, etc.)	7.5	
Paper for instructor – also upload to the Science Methods Wiki page by the evening before sharing in class		
Tradebook bibliography and summary included	5	
Performance Indicators are listed and appropriate for activities	5	
Text for activity cards included	5	
A list of assessment questions are included that are aligned with at least one fabric kit activity (preferably a science activity)	5	
Complete references for sources are included if applicable	5	
Spelling, grammar, mechanics	5	
Total Points	50	

Fabric Activity Kit – Construction Directions:

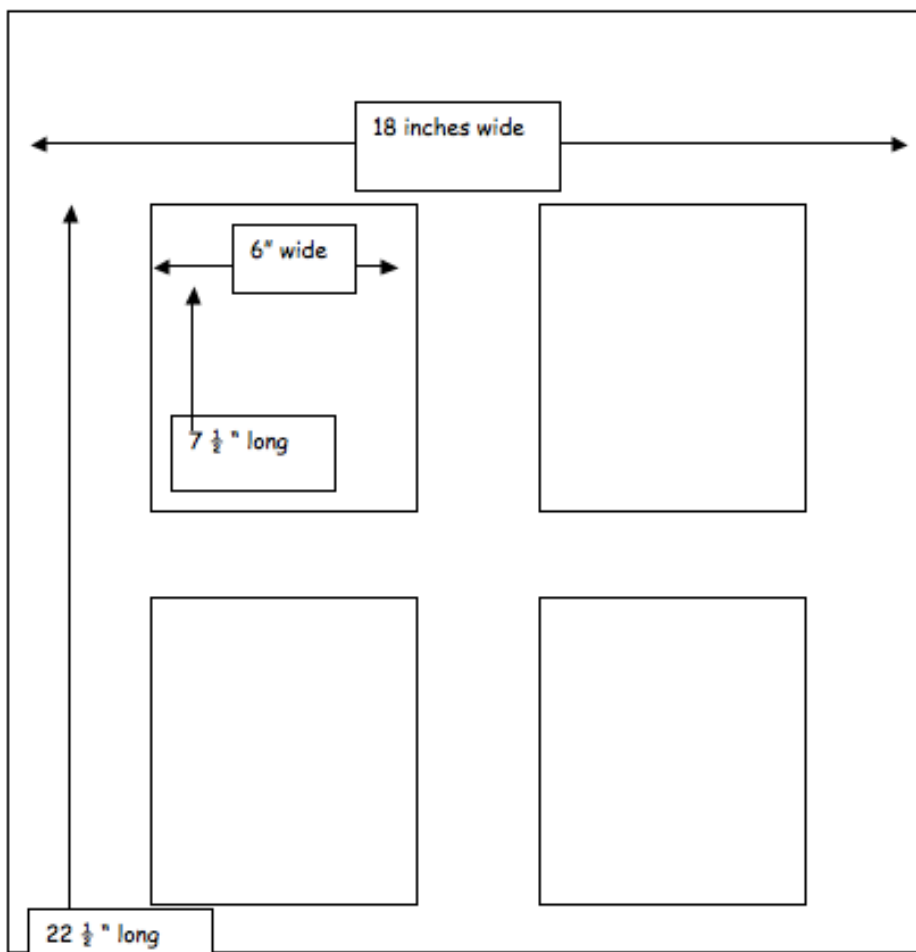
For each kit you will need:

- | | |
|--|---|
| <ul style="list-style-type: none"> • fabric for the front and back • poly-fil batting (quilt batting) for middle | <ul style="list-style-type: none"> • fabric for pockets • 15" of ribbon for the bow (cut in half) |
|--|---|

There are two combinations that we recommend:

Option A: Quilted fabric (18" x 22 $\frac{1}{2}$ ") with batting exposed on one side (use for outside of kit); un-quilted fabric (18" x 22 $\frac{1}{2}$ ") - use for inside of kit; fabric for 4 pockets, 15" of ribbon for the bow. Sew the pockets & ribbon (2 - 7 $\frac{1}{2}$ " segments to right side) on the inside fabric piece and then attach to quilted fabric.

Option B: Un-quilted fabric (18" x 45"). Sew pockets on one 18" x 22 $\frac{1}{2}$ " segment of fabric. Cut 18" x 22 $\frac{1}{2}$ " of poly-fil batting and insert/sew between folded 18" x 45" fabric to form kit. Add ribbon for bow.



Science Shoebox or Fabric Kit Group Evaluation

Title: _____

On a scale of 1-10 (10 best) rate the following:

- Ability to understand and follow student directions _____
- Directions are in kid-friendly terms for assigned grade level _____
- Ability to complete the task with the materials provided _____

Strengths:

Things to Improve:

Other Comments:

6E LESSON PLAN & DEMONSTRATION LESSONS – 75 POINTS

Purpose: To become familiar with science curriculum standards and to experience teaching key concepts using embedded inquiry. You will be expected to incorporate manipulatives and children’s literature. There are many supplies and hands-on materials available in the classroom from your professor; however, you may be expected to locate and purchase your own materials as well.

During class you will sign up as a group of 2-3 students to prepare the written lesson plan and implement a demonstration lesson in class as a team. Your professor will model how you will be expected to lead the class prior to your demonstration inquiry lesson. You will be required to:

- Write a lesson plan using the template provided
- Select a children’s tradebook to incorporate with the lesson
- Prepare a FACT per person in the group to align with the lesson - *see the last page of this packet for more details on preparing the FACT.*

You will be provided with a lesson plan format to use as a guide to prepare your 6E lesson plan. You can adapt lesson plans that you find in classroom resource books or online for this plan as long as you use the required format and reference your sources. You will have a limited amount of time to work with your partner(s) in class so I do recommend the use of Google Docs or other online tools of your choice to effectively collaborate with each other online.

Your completed template should be emailed to your professor at least 3 days prior to teaching the lesson. Your professor may ask you to revise or edit some activities so be sure to give yourself time to make edits. You & your partner will have 30 minutes to teach a hands-on part of your written lesson plan to our class. Be sure to literally practice your activities prior to teaching them to the class. Make notes to refer to as you teach and confer with your group to keep you on track and within your time limit. You will not have time to teach your entire lesson as written; however, you should be prepared with the supplies and include samples of work that you completed as you practiced on your own.

After your presentation submit a **thorough reflection** to the discussion section of the Science Methods Wiki Page for your Content Area. Discuss what you feel went well and what you would change if you were to teach the section again. Provide very specific instances from your presentation – be thorough. Do this by the evening of your presentation. Throughout the semester respond to at least 10 of your peers’ reflections. This will be your chance to provide “warm fuzzies” and constructive criticism that model quality feedback – go beyond – “you did great”. Give the “why” for how they did great and specific suggestions for improvement.

Grading Criteria – 6E Plan and Demo Lesson

		Points Possible	Points Earned
LESSON PLAN			
	Plan is turned in to professor at least 3 days prior to instruction to receive feedback and revisions are made as needed	10	
	Plan is written clearly so that another teacher could use/follow the lesson.	5	
	Plan addresses required components thoroughly	10	
	The main body of the lesson provides a variety of strategies to engage students. The strategies incorporate an inquiry component of all or part of the 6Es.	5	
PRESENTATION			
	<i>Materials</i> – all handouts, and supplies were prepared before class and efficiently used	15	
	<i>Time</i> – presentation was 45-60 minutes	5	
	<i>Organization and effectiveness of activities.</i> Was prepared, enthusiastic, and knowledgeable about activities. Prepared to use classroom technology.	15	
	<i>FACTs</i> Each member of the group implements a FACT effectively within the inquiry activity; tool is prepared prior to class; Each member clearly explains what the class should do and how the assessment will be used	5	
	Submit reflection to Science Wiki discussion section after presentation – same day. What went well? What would you change? Reflection is thoughtful & thorough	5	
	TOTAL	75	

INQUIRY PROJECT – 75 POINTS



Assignment: Complete an extended inquiry project in a group of 4-5 people.

Purpose: Teachers often teach in the manner in which they have learned. Many prospective and practicing teachers have not had experiences learning by inquiry.

Where to Start – the standards, of course! Locate a standard or set of standards at a particular grade level that your group can reach consensus upon studying.

Popular study choices:

Life Science: Mealworms or pillbugs

Earth/Space Science: Moon cycle - daily observation + eclipses; rocks & minerals (types & cycle)

Physical Science: Magnetism & electricity; simple machines (use of KEX); light, sound

Each group should develop an inquiry plan to study the chosen topic using the following outline. Each group will have a “Project Page” to work with on the Science Methods Wiki to document & post work throughout the project.

Create the following pages as part of your group’s Project wiki:

1. Concept Map Content Knowledge
2. Background Knowledge for Teacher
3. Resources for Teaching
4. Questions
5. Our Inquiry
6. Assessments

Day 1 – Select topic as a group.

- Prepare a concept map about what you know currently about your selected topic. Be as specific as possible with your map. Create your maps with your current knowledge. Do not reference other materials at this point. You should draw your maps by using the concept mapping Web 2.0 tool found at <https://bubbl.us/>. The concept map should be completed individually. Include a paragraph about your previous experience and comfort level with the topic as an additional node on your map. Embed your tool on the “concept map” page of your project wiki. Use a common color throughout your map to show your understanding “prior” to the project. You will revisit this tool and add to it after you have completed the project – you will need to use a different color for your “post” understanding. Add labels to the map to show what color represents pre and post understanding.

- As a group select several sources for collecting information about your topic - describe important information for the teacher in order to prepare to teach the topic - include common misconceptions students may have - cite sources and indicate when you are using direct quotes. Each person is responsible for documenting information from at least 2 sources on the “background knowledge for teacher” project page – one paragraph per source minimum.
- Each person should select 3 websites, 3 tradebooks, and 3 lesson plans about the topic and include them on the “Resources for Teaching” project page. Include a direct link to online websites and lesson plans. Each resource should include a 1-2 sentence annotation describing the resource. Include a picture of each tradebook as well.
- As a group, create a list of *testable* and *researchable* questions that you would like to discover the answers to regarding your topic. Each person should list at least 2 testable and 2 researchable questions on the “Questions” project page.

Any items not completed in class on Day 1 should be completed out of class prior to Day 2.
Label all of your work on the wiki with your initials in some way so that you can receive credit for your work.

Day 2

- Select at least one of the testable and one of the researchable questions submitted by your group for your topic and begin your inquiry as a group **PRIOR TO CLASS**. Document your work in class on the “Our Inquiry” project page. Be sure to write specific details regarding how you design your experiment and record results. Each member of your group can conduct the same test or you can choose to do variations. When appropriate complete multiple trials, collect data over time, and draw sketches/diagrams or take pictures when possible. Each member must participate in the collection of data. Include graphs and charts as necessary. Include your plans, sketches, pictures, and experimental data & findings on your project page.
- As a group, create a mixpod of instructional videos to embed on your “Resources for Teaching” project page. Instructions will be provided in class

Continue Data Collection between Day 2 and Day 3 out of class

Day 3

- Finalize data collection & analysis and document on “Our Inquiry” project page
- As a group, be prepared to share the following with the class:
 - Intriguing information that you learned as a result of your inquiries
 - What went well as well as difficult situations
 - How you plan to incorporate inquiry using your topic with your future students
- Assessments (upload to “Assessments” project wiki page)
 - Locate 5 standardized test items as a group (using stemresources.com) that can be used with your topic. Instructions will be given in class.
 - Each person should prepare one FACT
 - List the Formative Assessment Probes that apply directly to your inquiry topic.

- For homework...Individually, revisit your concept map that you completed at the beginning of your study and add ideas that you have learned as a direct result of your inquiry regarding your topic. Correct any areas that are misconceptions. Include directly on your 1st map (electronically) using a different color (use a key to distinguish pre & post). Changes should automatically be visible on the project wiki since the tool was embedded.

You will be given a deadline in class to finalize your assessments page & your concept map.

Science Inquiry Project Grading Sheet

Name _____

Group Members _____

Chosen Topic _____

Points will be assigned as outlined below for your Inquiry.

	Points Possible	Points Earned
Pre-assessment concept map	5	
Background Knowledge for Teacher	10	
Questions – list of 2 testable and 2 researchable	2.5	
Experimentation, data collection, and analysis	25	
Resources for teaching: websites, tradebooks, lesson plans, mixpod	15	
Assessment - 5 Standardized test items, FACT, Probes	10	
Discuss group work on Inquiry Project on Day 3	2.5	
Post-assessment concept map	5	
Total Points	75	

NSTA LEARNING CENTER EXPLORATION – 50 POINTS

Develop a Professional Development Plan and Portfolio through the NSTA Learning Center. For the purposes of this assignment, focus on “My Content Knowledge” or “My Content Pedagogy”. Think of a particular area of science in which you feel you need to increase your understanding of content or ways to teach the content. Use the “Explore Learning Opportunities” section of the NSTA Learning Center to locate free or low cost resources such as journal articles, Science Objects, SciGuides, podcasts, etc. to add to your “library”. Read at least 2 articles & complete one free 2 hour on-line inquiry-based “Science Object”. You can choose to include other resources in your PD Plan but the 2 articles and the “Science Object” are the minimum to include in order to be considered for full credit.

Follow the 6 steps within the PD Plan & Portfolio Tool. For this assignment, you may not have any specific evidence files to upload for step 4 (if you do that’s great!). Generate a report for your professional development. Print a copy of your file to give to your professor or email.

CONFERENCE ATTENDANCE ALTERNATIVE

Attend at least one day of one of the following conferences instead of completing the Learning Circus Assignment. You’ll need to attend as many sessions as you can, turn in a copy of your conference receipt and write a 1 – 1 ½ page summary/reflection of your experience to receive credit.

TN Math Teachers Association Conference

September 21-22; at TN Tech University in Cookeville

<http://www.tmta.info/conference.php>

Registration: \$45 (for preservice teachers)

TN Science Teachers Association Conference

Nov. 2-3; in Murfreesboro, TN

<http://www.tnsta.com/Conference.php>

Registration: ? Typically reduced to \$20 for preservice teachers (no registration form available yet)

BOTTLE ROCKET INQUIRY - PROBLEM BASED LEARNING – 50 POINTS

Assignment: Construct and launch a bottle rocket as part of a PBL activity to explore embedded engineering and technology standards.

Requirements and more information regarding this assignment will be shared in class.

PROJECT CENTS WORKSHOP COMPLETION 25 POINTS – PLT & WET

CENTS: Conservation Education Now for Tennessee Students
Environmental Education in Tennessee

<http://eeintennessee.org/net/content/go.aspx?noredirect=1&s=43193.0.0.37935>



Dr. Suters will facilitate a workshop on Tuesday, September 11 at Ijams Nature Center in Knoxville for 2 of the Project CENTS programs: Project Learning Tree & Project WET. As part of the workshop you will receive the curriculum guides free of charge. These guides are excellent materials for preparing you to integrate environmental education as part of TN state curriculum across content areas. A 6-hour workshop is required to provide one of the manuals but 2 manuals can be distributed in an 8-hour workshop. We will spend 7 hours in the “field” and 1 hour in our classroom with follow-up activities to earn the books.

PLT & WET

Date: Monday, September 11

Place: Ijam’s Nature Center, Knoxville – directions will be provided

Time: 9:00-4:00

Cost: Free

What to bring: sack lunch, clipboard, paper, pen or pencil, possibly a folding chair

Wear comfortable shoes and clothing for walking.

DISPOSITION – 50 POINTS

Ten percent of your course grade will be determined by your educational dispositions, which include the following:

- Attendance
- Tardies – includes late arrival and leaving early
- Collaboration
- Communication
- Scholarship
- Respect
- Responsibility
- Reflection

*More information concerning the dispositions is included in the accompanying handout.

You will be assigned a conference time with your professors at mid-term & the conclusion of the semester to review your disposition standing.

FACTs Preparation**(6E Lesson Plan & Demo Lesson & Inquiry Project)**

Formative Assessment strategies are essential for determining student understanding throughout the instructional process. Formative assessment should be used consistently with instruction to guide and direct you. You will be using *Science Formative Assessment: 75 Practical Strategies for Linking Assessment, Instruction, and Learning* by Page Keely as a guide. You will create one formative assessment tool for each assignment listed above.

PREPARATION

- Read the section in the *Science Formative Assessment* text pertaining to your tool.
- Prepare a handout or the materials needed to conduct the assessment for class. Make copies of the handout for the class to use if using as part of your lesson or print one copy to display on document camera as needed for your tool. Some tools will not need a paper handout for students; however, you should still type a description of your tool and how/when you would use it with your 6E Plan or Inquiry Project.
- Post to the associated page of the Science Methods Wiki – based on the specific assignment.

DURING DEMONSTRATION 6E INQUIRY LESSON

- Integrate your formative assessment tool within your presentation of your lesson or inquiry activity
- These assessment tools do not need to be lengthy to be effective. If your particular tool is time consuming you can give the class a taste of it and then move on to the rest of your inquiry activity.
- Be prepared to explain clearly what the class is to do for the assessment and what you will use the results for